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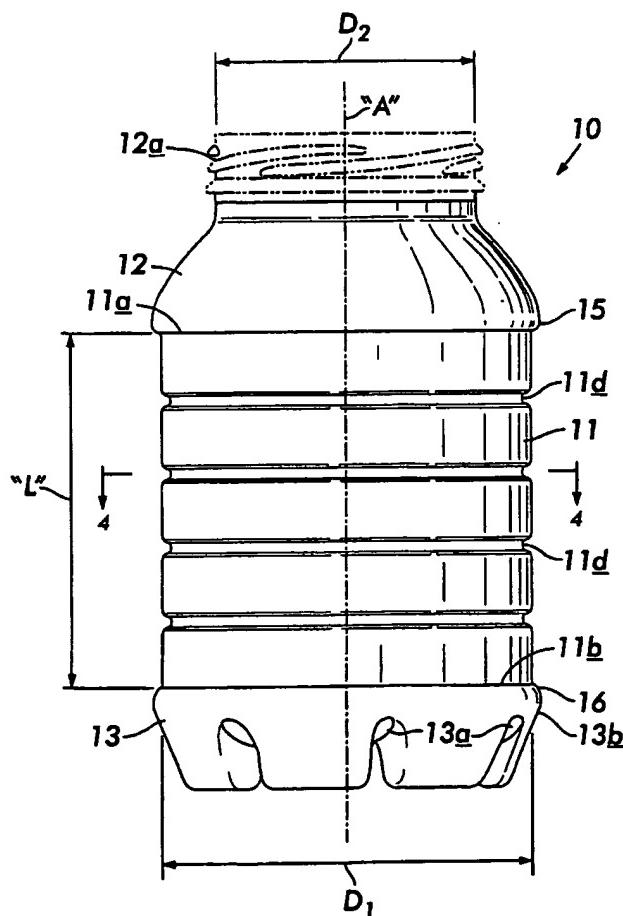
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[Continued on next page]

(54) Title: PASTEURIZABLE WIDE-MOUTH CONTAINER



(57) Abstract: A wide-mouth blow-molded plastic container (10) capable of accommodating, without undesirable distortion, super-baric pressures when filled with volatile food products and pasteurized, and sub-baric pressures after cooling to ambient temperatures. A method of packaging a food product in the container (10) is also disclosed.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

PASTEURIZABLE WIDE-MOUTH CONTAINER

Field of the Invention

The present invention relates to blow-molded plastic containers, and more particularly, the present invention 5 relates to a wide-mouth blow-molded plastic container which is particularly suited for containing volatile food products that require pasteurization at elevated temperatures after the container has been filled and capped.

Background of the Invention

10 Glass has been the material of choice for pasteurizable containers designed to package volatile food products that off-gas after filling and sealing. Such products include, but are not limited to, pickles, relish, sauerkraut, and the like. Glass has been desirable because of its strength and 15 low cost; however, glass containers are heavy and breakable.

There is a need for a plastic container which is particularly suited for packaging the afore-described products by being robust enough to withstand the rigors of heat pasteurization. For instance, such a container must be 20 capable of withstanding internal pressures at high temperatures, followed by internal vacuum at lower and ambient temperatures. Hot-filled PET (polyethylene terephthalate) narrow neck bottles have been commercialized for containing liquids, and hot-filled PET wide-mouth food 25 jars have been commercialized for containing non-volatile food products such as applesauce, jams, jellies, and the like which do not off-gas after filling and capping. To date, there is no known commercially-available, wide-mouth, PET container that is capable of being filled with volatile food 30 products, capped, and subsequently pasteurized.

U.S. Patent No. 5,980,128 discloses a narrow-mouth, blow-molded plastic container used to contain liquid products which are pasteurized after filling and capping. The

disclosed container uses specifically defined peripheral flex panels to accommodate the pressure and volume changes inside the capped container.

U.S. Patent No. 4,642,968 disclosed a wide-mouth, blow-molded plastic container that is used for containing products that undergo pasteurization. The container disclosed in this patent utilizes bottom-bulging of the container body to accommodate internal pressure and volumetric changes.

U.S. Patent No. 5,887,739, owned by Graham Packaging Co., L.P., discloses a wide-mouth, blow-molded PET container suitable for hot filling with viscous food products such as applesauce.

Object of the Invention

With the foregoing in mind, a primary object of the present invention is to provide a pasteurizable plastic container which satisfactorily resists internal pressures due to increased vapor pressures during heating and contained volatile food products while withstanding internal vacuum conditions on cool-down to ambient temperatures after pasteurization.

Summary of the Invention

More specifically, the present invention provides a wide-mouth blow-molded plastic container which is capable of accommodating, without undesirable distortion, super-baric pressures when filled with volatile food products and pasteurized, and sub-baric pressures after cooling to ambient temperatures. The plastic container comprises a cylindrical sidewall having a plurality of peripheral vertically-spaced grooves. A dome with a wide-mouth opening adapted to receive a sealed closure is located above the sidewall, and a footed pressure-resistant base is located below the sidewall. An upper label bumper extends around the upper end of the

sidewall subjacent the dome, and a lower label bumper extends around the lower end of the sidewall super- adjacent the base. In the aforedescribed structure, the sidewall grooves cooperate with the dome and base to stiffen the sidewall
5 against undesirable distortion due to the swing from super-baric to sub-baric pressures within the container. Preferably, the sidewall has a crystallinity in excess of 25 percent; the base is of petaloid configuration; and the wide-mouth opening has a diameter which is sufficiently large to
10 afford access to the container and removal of contained food products by means of a conventional item of tableware.

Brief Description of the Drawing

The foregoing and other objects, features and advantages of the present invention should become apparent
15 from the following description when taken in conjunction with the accompanying drawing, in which:

Fig. 1 is a side elevational view of a container embodying the present invention;

Fig. 2 is a plan view of the container of Fig. 1;

20 Fig. 3 is an inverted plan view of the container illustrated in Fig. 1;

Fig. 4 is a transverse sectional view taken on line 4-4 of Fig. 1; and

25 Fig. 5 is a longitudinal sectional view taken on line 5-5 of Fig. 3.

Description of Preferred Embodiment

Fig. 1 illustrates a container 10 which embodies the present invention. The container 10 has a sidewall 11, a dome 12 superadjacent the sidewall 11, and a base 13 below
30 the sidewall 11. The dome 12 has a wide-mouth, threaded finish 12a which is blow-molded such as in the manner

described in U.S. Patent No. 5,887,739, the disclosure of which is incorporated by reference herein.

The base 13 is of conventional construction, being of a so-called footed, petaloid, pressure-resistant configuration. The base 13 includes a plurality of radially extending, downwardly concave ribs 13a which extend outwardly from the longitudinal axis "A" of the container 10 to the outer surface 13b of the base 13. The disclosed footed, petaloid base design is well known in the art and is exemplified in expired U.S. Patent No. 3,935,955. Such bases have found particular utility in carbonated beverage containers.

The sidewall 11 is adapted to receive a conventional label. In order to protect the label, as well known in the art, an upper label bumper 15 is provided subjacent bottom of the dome 12 around the upper edge 11a of the sidewall 11. A similar lower label bumper 16 is provided superadjacent the base 13 around the lower edge 11b of the sidewall 11. The upper and lower label bumpers 15 and 16 extend radially outward a slight distance from the sidewall 11 and about the container periphery to provide protection for a label, not shown, applied to the sidewall 11 as well known in the art.

The disclosed container has a capacity of twenty-four ounces. The sidewall 11 has a length "L" which is substantially equal to its diameter in D_1 . The blown finish 12a has an outer diameter D_2 . Preferably, the diameter D_2 is about 80 percent of the diameter D_1 . This enables the contents of the container 10 to be accessed readily by means of a conventional item of tableware, such as a fork or tablespoon.

In the illustrated embodiment, the sidewall 11 is reinforced at spaced vertical intervals by means of a plurality of continuous peripheral grooves 11d. Desirably, the grooves 11d are located on approximately .6 inch centers and extend continuously about the periphery of the sidewall 11. Desirably, each groove 11d has a depth of approximately

0.08 inches and is formed by bottom radius of curvature of 0.06 inches and upper and lower bottom connecting radii of curvatures of 0.118 inches. This groove construction enables the sidewall to accommodate changes in volume and pressure
5 inside the container, as will be discussed.

The disclosed container 10 is preferably molded of PET. The container 10 is blow-molded from a preform that has a portion which is blown outwardly to form the finish 12a, after which a moiil portion of the blown preform above the
10 finish 12a is severed. In the molding process the preform is stretched axially, and the mold temperature and residence time is designed to provide the sidewall 11 with a crystallinity of at least 25 percent throughout its entire length L. The thickness of the sidewall 11 is about .030
15 inches above and below, and in- between, the grooves 11b. The nominal weight of the disclosed container 10 is preferably less than about 53 grams.

A container of the configuration illustrated in the drawing has been blown and tested in a laboratory setting.
20 The test container 10, illustrated in Fig. 1 (drawn to full scale) had an overall sidewall length of 3.264 inches; an outer sidewall diameter D₁ of 3.4 inches; and a finish diameter D₂ of slightly less than 2.75 inches. The container 10 was filled with a volatile vegetable that off-gases, such
25 as pickles in an aqueous medium, to a level of 0.250 inch from the upper edge of the finish 12a. A sealed cap was applied to the finish 12a, and the thus-filled container 10 was pasteurized at a temperature of in a range of 200 - 210°F for 10 - 20 minutes. A control glass jar of like capacity
30 and size was used to simulate the pressures and temperatures developed inside the container 10 during and after pasteurization. The container was allowed to cool to ambient temperature subsequent to the pasteurization cycle. During pasteurization, pressures within the container 10 exceeded 10
35 inches Hg. The container did not undergo undesirable

distortion such as would be considered unsatisfactory in commercial practice.

It is believed that the petaloid, pressure-resistant, footed base 13 enabled the container 10 to withstand the 5 internal pressures developed during pasteurization while the grooved sidewall 11 cooperated with the other disclosed structures to accommodate both super-baric and sub-baric pressure and volume changes resulting from cool down of the container 10 to ambient temperatures.

10 Since pasteurization is a time-temperature phenomenon, the temperature range in practice may be as low as 190° F when longer residence times are used, and the time as short as 5 minutes when higher temperatures are used. Also, while the test was conducted with pickles, other volatile 15 vegetables including, relish, sauerkraut, artichokes, and the like may be suitably pasteurized in the disclosed container.

An advantage of selecting the disclosed container for use in packaging pickles is the energy and water savings that can be realized. This is because for the past seventy five 20 years pickles have been packed in glass jars which require staged heat treatment due to the inability of glass to accommodate rapid temperature changes. Currently, cold pickles are charged into empty, pre-heated glass jars, and brine at 130° F is added. After capping, the sealed glass 25 jar is heated to a temperature in a range of 195 - 210° F for 10 - 20 minutes to heat the center of the pickles contained in the jar to a minimum temperature of 165° F for 15 minutes. Thereafter, the pasteurized jar is stage cooled to 180° F for 10 - 20 minutes, followed by 140° F for 10 - 20 minutes, and 30 then cooling to ambient.

With the disclosed PET plastic container, brine can be added at 180° F to a container at ambient temperatures with sterilization at 190° F for a shorter period of time, followed by cooling to ambient. This results in a shorter 35 processing time, reduced energy consumption, and a savings in water.

In view of the foregoing, it is apparent that the present invention provides a wide-mouth, blow-molded PET plastic container which can be substituted for glass to contain food products that off-gas during pasteurization.

5 While a preferred embodiment of the present invention has been described in detail, various modifications, alterations and changes may be made without departing from the spirit and scope of the present invention as defined in the appended claims.

Claims

1. A wide-mouth blow-molded plastic container (10) capable of accommodating without undesirable distortion super-baric pressures when filled with product at elevated temperatures and capped and sub-baric pressures after cooling to ambient temperatures comprising;
 - a sidewall (11) having a plurality of peripheral vertically spaced grooves (11d);
 - 10 a dome (12) located above said sidewall (11) having a wide mouth opening (12a) adapted to receive a sealed closure;
 - a footed, pressure resistant, base (13) below said sidewall (11);
 - 15 an upper label bumper (15) extending around the upper end (11a) of said sidewall (11) subjacent said dome (12); and
 - a lower label bumper (16) extending around the lower end (11b) of said sidewall (11) superadjacent said base (13);
- 20 whereby the sidewall grooves (11d) cooperate with the dome (12) and base (13) to stiffen the container (10) against undesirable distortion due to the swing from super-baric to sub-baric pressures within the container (10) when filled and capped.
- 25 2. A wide-mouth blow-molded PET plastic container (10) capable of accommodating without undesirable distortion super-baric pressures when filled with product at elevated temperatures and capped and sub-baric pressures after cooling to ambient temperatures comprising;
 - 30 a cylindrical sidewall (11) having a plurality of peripheral vertically spaced grooves 11d); said sidewall (11) having a crystallinity in excess of 25 percent;

a dome (12) located above said sidewall (11) having a blown wide-mouth opening (12a) adapted to receive a sealed closure; said opening (12a) having a diameter (D_2) sufficient to afford access to and withdrawal of said food product by means of a conventional item of tableware;

5 a petaloid footed base (13) below said sidewall (11); an upper label bumper (15) extending outwardly and peripherally around the upper end (11a) of said sidewall (11) subjacent said dome (12); and

10 a lower label bumper (16) extending outwardly and peripherally around the lower end (11b) of said sidewall (11) superadjacent said base (13); whereby the sidewall grooves (11d) cooperate with the dome (12) and base (13) to stiffen the container (10) against undesirable distortion due to the swing from super-baric to sub-baric pressures within the container when filled and capped.

3. An energy-efficient method of packaging a food product,

20 comprising the steps of:

selecting a blow-molded PET plastic container (10) having a sidewall (11) with a plurality of peripheral vertical grooves (11d), a dome (12) located above said sidewall (11) having a blown, wide-mouth opening (12a) adapted to receive a sealed closure, a footed base (13) below said sidewall (11), an upper label bumper (15) extending around the upper end (11a) of said sidewall (11) subjacent said dome (12), a lower label bumper (16) extending around the lower end (11b) of said 25 sidewall (11) superadjacent said base (13);

30 hot-filling the container (10) with said food product; capping the filled container (10); heating the filled and capped container (10) for a time at a temperature sufficient to pasteurize said food product;

35 and

cooling the pasteurized filled and capped container (10) to ambient temperature.

4. The method according to Claim 3 wherein said food product is a volatile vegetable in an aqueous medium.

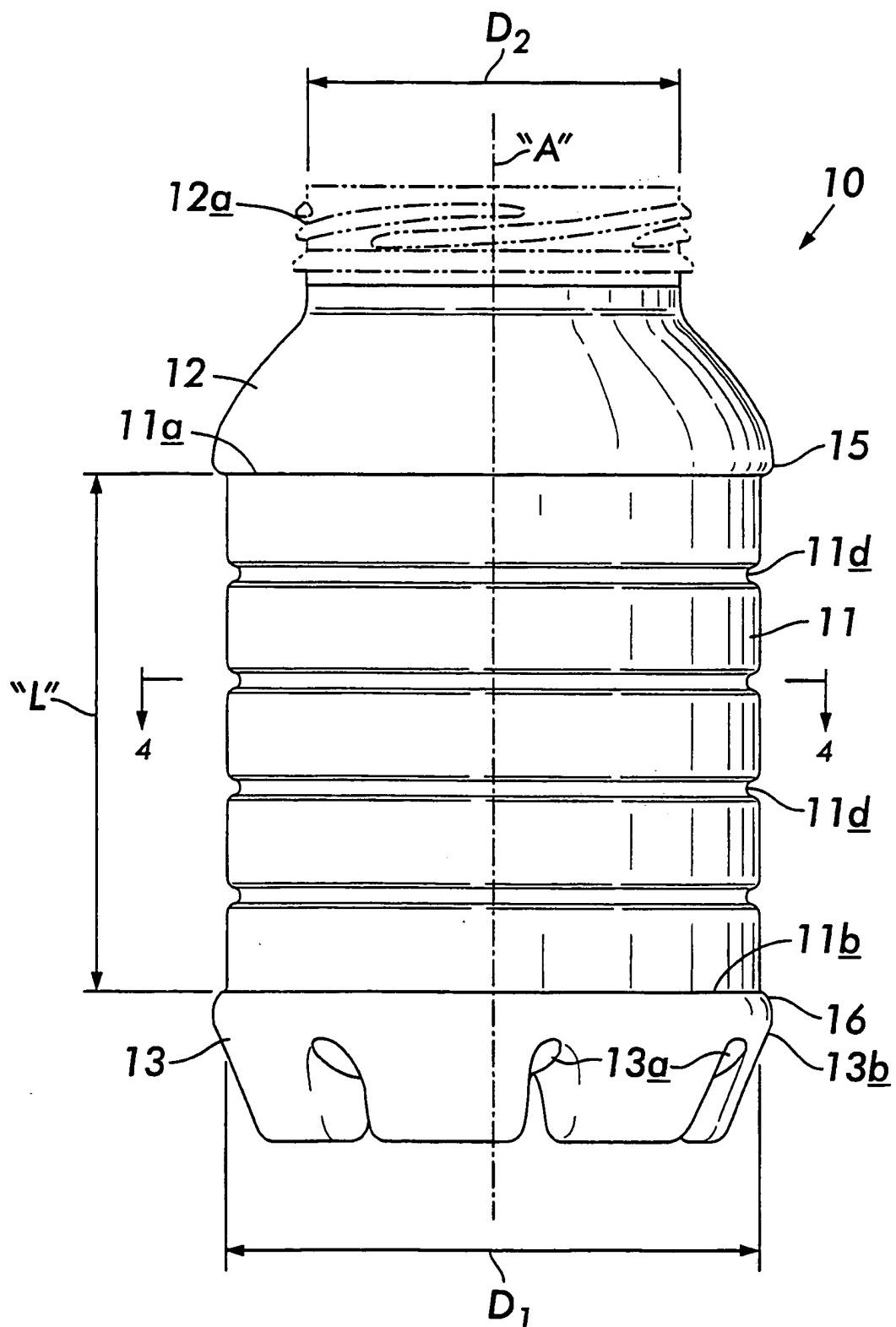
5 5. The method according to Claim 4 where said volatile vegetable is selected from the group consisting of: pickles, relish, sauerkraut and artichokes.

6. The method according to Claim 3 wherein said filled and capped container is heated to a temperature in a range of at 10 least about 190 - 210° F for a period in a range of 5 - 20 minutes.

7. The method according to Claim 3 wherein said hot-filling steps occurs at a temperature of at least about 180° F.

8. The method according to Claim 3 wherein the container 15 is at ambient temperature prior to hot-filling.

1/3

**FIG. I**

2/3

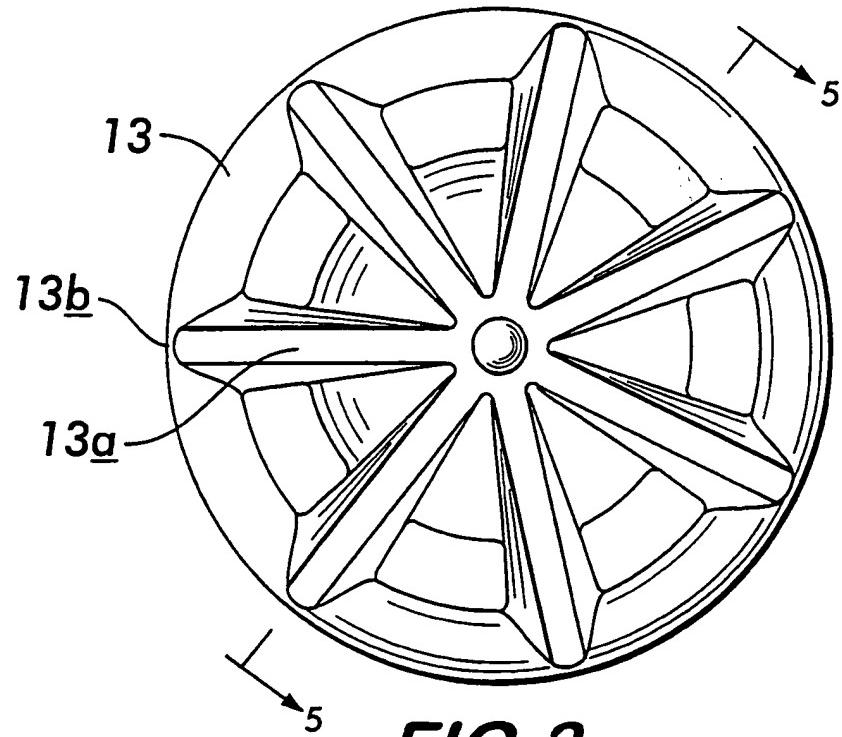
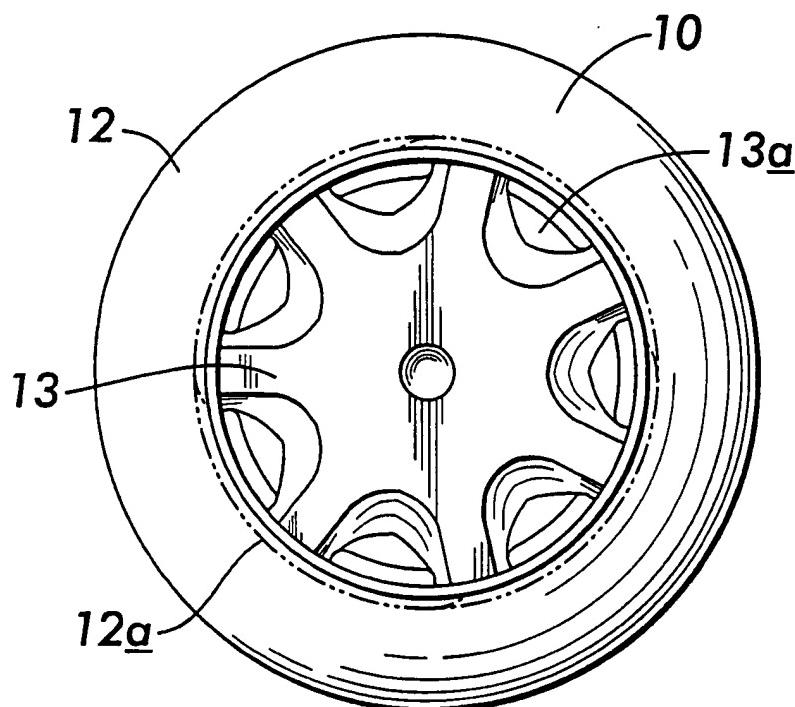
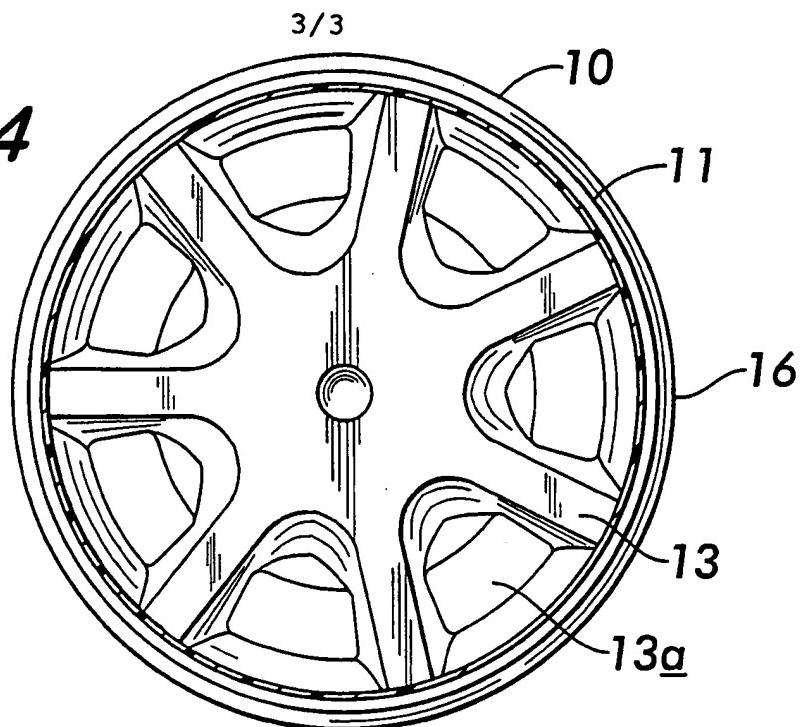
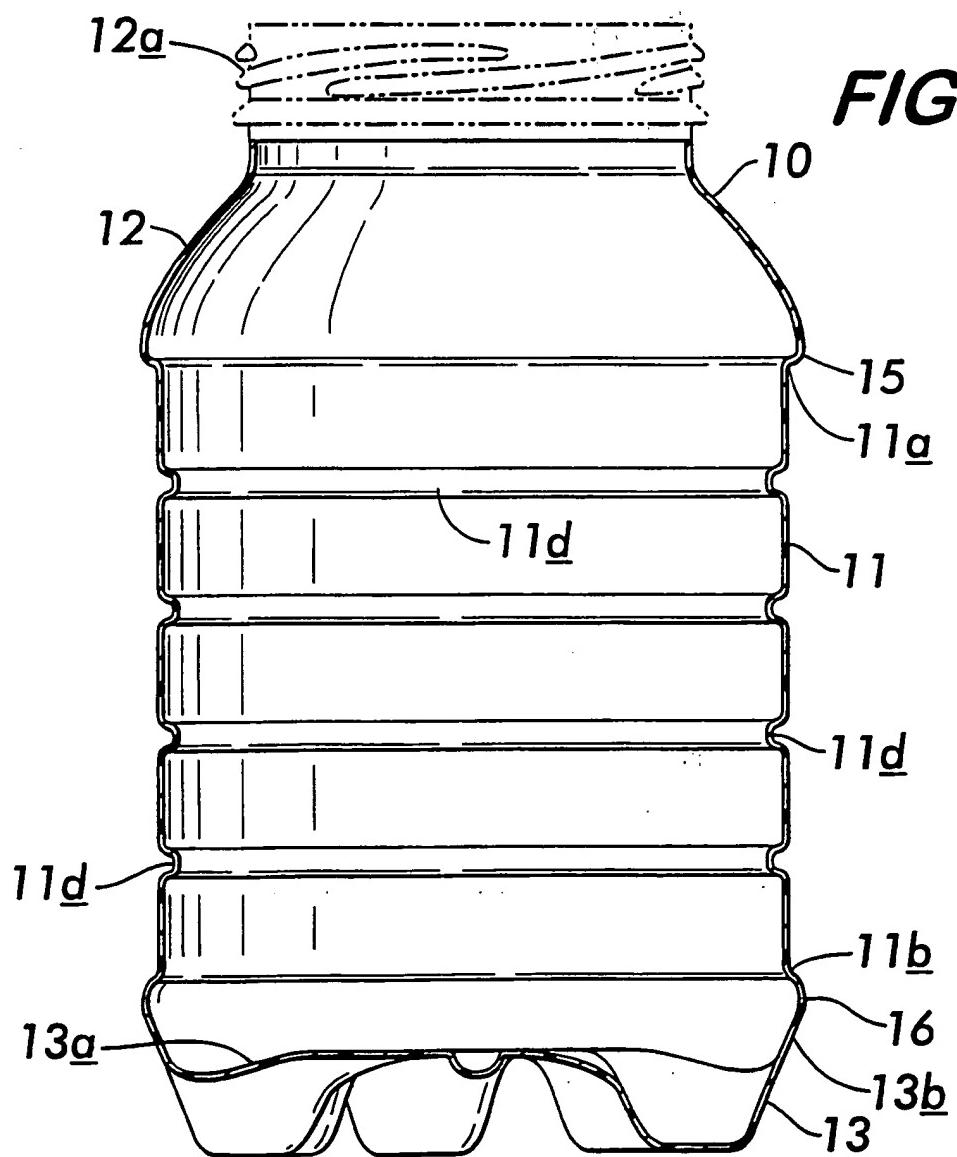
FIG.2**FIG.3**

FIG.4**FIG.5**

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/31834

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :B65D 90/02, 90/12
US CL :215/370, 375, 377, 379, 382

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 215/370, 375, 377, 379, 382

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,690,244 A (<i>DARR</i>) 25 November 1997, See figures.	1-2
Y	US 3,397,724 A (<i>BOLEN et al.</i>) 20 August 1968, See figure 1.	1-2
Y	US DES. 269,158 S (<i>GAUNT</i>) 31 May 1983, See figures.	1-2
Y	US DES. 415,030 S (<i>SEARLE</i>) 12 October 1999, See figures	1-2

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means		
"P" document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

07 FEBRUARY 2001

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US00/31834

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Please See Extra Sheet.

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1 and 2

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US00/31834

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING

This ISA found multiple inventions as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group I, claim(s)1-2, drawn to a container.

Group II, claim(s)3-8, drawn to a method for packaging.

The inventions listed as Groups II and I do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: The invention in Group I can be practiced by other method, i.e., the container in Group I can be used to without the steps of hot-filling and/or heating the filled and capped container. Furthermore, the food product, and the container can be heated prior to the hot-filling step. In addition, the method as claimed can be practiced without the use of a petaloid footed base.